ELECTRONIC CALCULATOR CASIO PRO fx-1INSTRUCTION MANUAL



INTRODUCTION

Dear Customer,

Congratulations on your purchase of the most advanced electronic calculator. This is a scientific calculator equipped with a 127-step program function with a special "Magnetic Card" that makes repeat and complex calculations easy and trouble-free. This program function is in addition to such big features as one-touch function keys that allow you to easily perform mixed calculations in the four arithmetic operations, an independent memory, 10 constant memories and 100-digit $(10^{\pm 9.9})$ calculation capacity.

This scientific calculator realizes a true "Card Program System" by storing programs in the "Magnetic Card", from which they can be transferred to the

calculator.

No special training is required to utilize the full features of this calculator but we suggest that you study this instruction manual carefully to become familiar with the many abilities of this calculator. This manual was written to assist you in understanding the various control keys and functions of the calculator through simple examples and their applications.

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DISPOSABLE DRY BATTERY OR AC OPERATION

This calculator operates on either dry batteries or AC with the use of the AC ADAPTOR.

DRY BATTERY OPERATION

With four AA size Alkaline dry batteries (AM-3) it operates approximately 12 hours continuously.

When battery power decreases, the display will disappear suddenly. Batteries should at this time be renewed.

To change batteries, put the power switch off first. Slide open the battery cover and replace batteries.

AC OPERATION

If you are in a 117V area, for instance, use a 117V AC ADAPTOR. When you use an AC ADAPTOR of a different voltage, it may cause damage to both the AC ADAPTOR and calculator. Plug the applicable AC ADAPTOR (100, 117, 220 or 240V) into the AC outlet and the cord into the calculator. When plugged in, battery power supply stops automatically, so battery power is not wasted.

* USE OF THIS CALCULATOR WITH A MAINS ADAPTOR OTHER THAN THE CASIO MAINS ADAPTOR, INVALIDATES THE GUARANTEE.

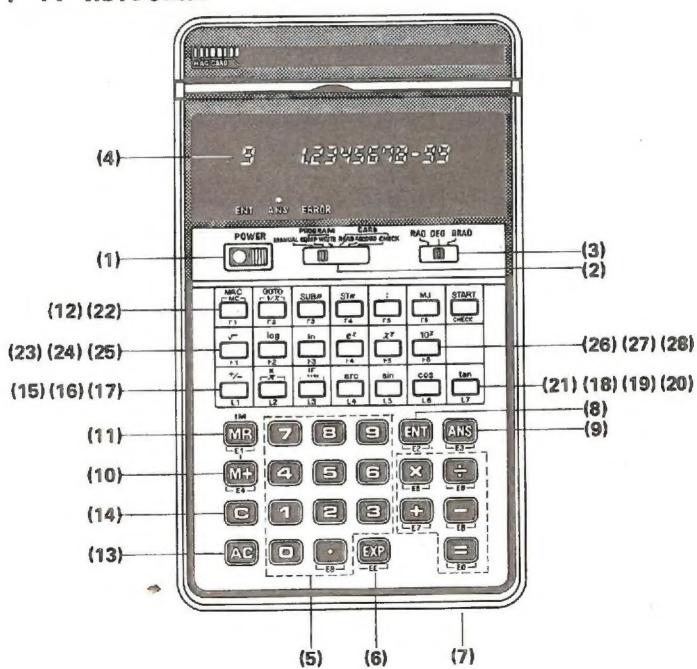
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6V 1.5W

PART-1 Manual calculations

In Part 1 we will explain the functions of the calculator, excluding the program function, and the method of operation. That is, in this part, we will explain only what is necessary for manual calculating.

1-1. KEYBOARD



(1)	POWER SWITCH:	
	the switch to the right and "(" appears to show the calculator is ready
_	PROGRAM CARD	
MALLALA	COMP WOITE PEAN PERSON OFFICE	

(2) PROGRAM SWITCH:

When performing manual calculations, set the program switch to the "MANUAL" position.

(3) ANGULAR MODE SELECTOR:

By setting the selector either at "RAD" (Radian), "DEG" (Degree) or "GRAD" (Grade) position, trigonometric (or inverse trigonometric) functions can be performed based on the angular measurement indicated by the selector.

O. READ—OUT:

Shows each entry and result, whether in the regular 10 digit display or in scientific notation, through a green digitron tube, suppressing unnecessary O's (zeroes).

In some calculations, the "-" sign appears momentarily while complicated formulas are being processed. So do not enter numerals or press the function keys until the previous answers are displayed.

The data memory numbers are displayed in the upper digit along with the lighting of the ENT lamp (When values are stored in the memory) and the ANS lamp (When values are read out). The ENT lamp is indicated by (ENT) and the ANS lamp by (ANS) in this manual.

(5) - NUMERAL & DECIMAL POINT KEYS:

Enters numerals. For decimal places, use the le key in its logical sequence.

(6) I ENTER EXPONENT KEY:

Enter the exponent of ten up to $10^{\pm 99}$. To enter 2.56 x 10^{45} , operate 2.56245.

Press the numeral and function command keys in the same logical sequence and the likely obtains the answer.

(8) 回 DATA INPUT KEY:

Press to store displayed number in a data memory. To store 12.3 in data memory number 3, for example, press 12 3 3

(9) DATA OUTPUT KEY:

Press to display the number stored in a data memory. To display the contents of data memory number 9, for example, press 🖼 😑

There are 10 data memories: 1~9 and 0.

The contents do not change until a new entry is made.

(10) MEMORY PLUS KEY:

Transfers the number displayed into the memory positively. Obtains answers

in four functions and N-th power calculation, and automatically accumulates them into the memory positively.

(11) I MEMORY RECALL KEY:

Recalls contents of the memory without clearing the same.

(12) MEMORY CLEAR KEY:

Clears contents of the memory.

(13) A ALL CLEAR KEY:

Clears the entire machine except the independent memory and data memories, and releases an overflow check.

(14) C CLEAR KEY:

Clears keyboard entry for correction (including entries in scientific notation), and also clears answers of functions while performing mixed calculations.

Function command keys $(+, -, \times, \div, x^y)$ can be interchanged and the last function key depressed is effective.

(15) 🗹 SIGN CHANGE KEY:

Changes the sign of the number displayed from plus to minus and vice versa.

(16) 元 Pi KEY:

Enters the circular constant in 10 digits (3.141592653).

(17) SEXAGESIMAL → DECIMAL CONVERSION KEY:

Converts the sexagesimal figure to the decimal scale.

(18) Sin SINE KEY:

Obtains the sign for the angle on display.

(19) COSINE KEY:

Obtains the cosine for the angle on display.

(20) E TANGENT KEY:

Obtains the tangent for the angle on display.

(21) ST ARC KEY:

Performs inverse trigonometric functions in combination with the sin, or the key.

(22) 1 RECIPROCAL KEY:

Obtains the reciprocal of the number displayed.

(23) SQUARE ROOT KEY:

Obtains the square root of the number displayed.

(24) G COMMON LOGARITHM KEY:

Obtains the common logarithm of the number displayed.

(25) In NATURAL LOGARITHM KEY:

Obtains the natural logarithm of the number displayed.

(26) EXPONENTIAL KEY:

Raises the constant e (2.7182818.....) to x powers.

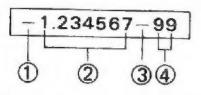
(27) POWER RAISING KEY:

Raises the base x to y powers.

(28) W X POWER OF 10 KEY (INVERSE LOG KEY): Raises the constant 10 to x powers.

1-2. NOTICE

(1) SCIENTIFIC NOTATION



- 1 The minus (-) sign for mantissa.
- 2 The mantissa.
- The minus (—) sign for exponent.
- 4 The exponent of ten.

When the answer is more than 1×10^{10} or less than 1×10^{-2} , it is automatically shown by the scientific notation, 8 digit mantissa (7 negative digits) and exponent of ten up to ± 99 .

Entry can also be made in the form of scientific notation by using the (Enter Exponent) key. Note that the key does not work when the first entry (mantissa) is made exceeding 8 digits (7 digits, when the figure is negative).

EXAMPLE	OPERATION	READ-OUT
$(1.23\times10^{10})+(4.56\times10^{7})$ = 1.23456×10 ¹⁰	1⊡23	1.23 00
=1.23456×10 ¹⁰	10	1.23 10
	(4)	1.23 10
	4⊡56	4.56 00
	7	4.56 07
		1.23456 10

The answer is read: $1.23456 \times 10^{10} = 12345600000$

Remark:

*Regular entries are possible up to 10 digits.

No entry can be made above that even though the keys are pressed.

*Exponent entries are possible only when the mantissa part is from 1 to 8 digits (7 digits for negatives).

*When entries with 3 or more digits are made after depressing the key, the final 2 digits becomes exponent.

(2) OVERFLOW CHECK

Overflow is indicated by an "E" sign and stops further calculations.

To release the locked registers caused by the overflow check, depress the key.

Overflow occurs:

1) When an answer or accumulated total in the memory becomes more than 1×10^{100} .

When the function calculations are performed on a number exceeding their input range.

Remarks: The content of the memory is protected against overflow and the total accumulated so far is recalled by the key after the overflow check is released by the key.

1-3. BASIC OPERATIONAL EXAMPLES

* There is no need to depress the AB or B key prior to starting each new calculation.

* A negative figure is displayed with a minus (-) sign on the left of the figure.

EXAMPLE	OPERATION	READ-OUT
12+3-45.6)×89÷7	12∰3∰45 ⊡6⊠89∰7⊟	-389.0571428
= -389.0571428 $963 \times (56 - 23) = 31775$	56623⊠963⊟	31779.
12369×7532×74103 5.9036806×10 ¹²	3≒ 12369⊠7532⊠74103⊟	6.9036806 12
=6903680600000) 1.23÷56÷78.9≑ 2.7838131×10 ⁻⁴	1	2.7838131-04
(=0.00027838131) $(7.9 \times 10^{56}) \div (4.6 \times 10^{7})$ $(1.3 \times 10^{23}) =$ (223260.8695)	the sign of displayed number the negative exponent, use the	from plus to minus (complex key before or after
(-9)×2.6-(-12.3)=-	9世区206日1203四日	-11.1
- 1 02672×10-38	0 ⁵) ×(1.2×10 ⁻¹⁹)×(-2.3×10 4⊡5回6閏7⊡8⊠回5図	3720000. -1.02672-38
	• 2 2 1 9 2 2 2 • 3 2 2 6 2 6	-1.02672-30

ENTRY ☐ ☐ (☐ ☐ , ☒ ☒ or ☐ ☐)ENTRY ☐ obtains answer.

To be set as a constant.

* To renew the constant, follow the operation step as above.

EXAMPLE	OPERATION	READ-OUT		
3+2.3=5.3	2 ⊡ 3 🖺 🗒 3 🗏	5.3		
6+2.3=8.3	6⊟	8.3		
7 - 5.6 = 1.4	5 ⋅ 6 = = 7 =	1.4		
(-4.5)-5.6=-10.1	4 ∙ 5 ₺ 🖹	-10.1		
$2.3 \times 12 = 27.6$	12⊠⊠2⊡3目	27.6		
$(-9) \times 12 = -108$	92 =	-108.		
$74 \div 2.5 = 29.6$	2 → 5 🕮 🗎 7 4 🖹	29.6		
$85.2 \div 2.5 = 34.08$	85	34.08		
17+17+17+17=6.8	107000	3.4		
		5.1		
		6.8		
$1.7^2 = 2.89$	1 1788	2.89		
$1.7^3 = 4.913$		4.913		
$1.7^4 = 8.3521$		8.3521		
$\frac{1}{1}$ = 0.25	4888	1.		
$\frac{1}{4} = 0.25$		0.25		
$\frac{1}{4^2} = 0.0625$		0.0625		

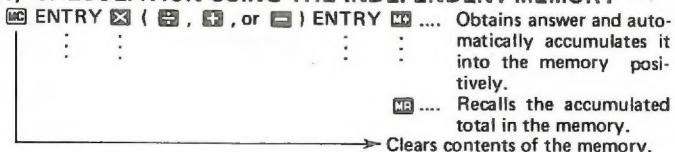
* Reciprocal calculations can be performed by the use of the constant capability.

56		
$\frac{36}{4\times(2+3)}$ = 2.8	2∰3⊠4∰ ∰	20.
4~(2+3)	56日	2.8

1-5. MEMORY CALCULATION

This calculator is equipped with one independent memory, using and as , as well as 10 data memories using and as .

(1) CALCULATION USING THE INDEPENDENT MEMORY



* To accumulate a number into the memory negatively, change the sign from plus to minus by the ½ key prior to depressing the 🕮 key.

Be sure to depress the key prior to starting a memory calculation.

EXAMPLE	OPERATION	READ-OUT
852×147=125244	© 852⊠147 ©	125244.
$-)789 \times 654 = 516006$	789🖾654 🗹 🍱	-516006.
-390762	MR	-390762.
70+40+100=210	EC70E40E100E	210.
+)80- 5+ 20= 95	80 5 5 20 0	95.
305	MR	305.
$4.5 \times 12 = 54$	©12××4 · 5 ·	54.
$-)5.6 \times 12 = 67.2$	5⊡6₺₩	-67.2
$+)6.4 \times 12 = 76.8$	6 ⋅ 4 🖽	76.8
63.6	MR	63.6

* The the key also works to transfer a number displayed, whether entry or result, to the memory positively as many times as the the key is depressed.

$$7+7-7+(2\times3)+(2\times3)=19$$

(2) CALCULATION USING THE DATA MEMORIES

* There are 10 data memories: 1~9 and 0. Data and answers can be freely stored in any of these.

Normally, displayed number is stored in the memory.
When a new number is entered into the memory, the previous number

stored is cleared automatically and the new number is stored.

* When a number is put into a data memory the memory number and the "ENT" lamp light: when a number is recalled from the memory, the memory number and the "ANS" lamp light.

EXAMPLE	OPERATION	REA	D-OUT
$193.2 \div 23 = 8.4$ $193.2 \div 28 = 6.9$ $193.2 \div 42 = 4.6$	193 - 2 11 1	© 1	193.2
	□23目		8.4
		@ 1	193.2
	₿28₿		6.9
	13 1₽42₽		4.6

$$(1\times8+1)\times12345679=111111111$$

$$(2\times8+2)\times12345679=2222222222$$

$$(3\times8+3)\times12345679=33333333333$$

101×802+01×12345679113 E

2M1×42+41×43=

3 M 1 × 45 2 + 16 1 × 45 2 =

1	1	1	1	1	1	1	1	1.
2	2	2	2	2	2	2	2	2.
3	3	3	3	3	3	3	3	3.

$$\frac{9\times 6+3}{(7-2)\times 8}$$
 -1.425

9×6+3=111 7=2×8=112

(en)	1	5 7.
(BIT)	2	4 0.
		1.425

$$(2+3)\times(9-5)-(8\times6)+(7\div4)=-26.25$$

2#38**21**9**2**5**3282**6**2113**7**2**4**22**

-26.25

1-6. FUNCTION CALCULATION

This calculator computes various specific functions at one touch, independent of basic arithmetic calculations.

* The maximum effective number of digits for functions is 8. Output accuracy is \pm 1 in the 8th digit (\pm 1 in the 7th digit for x^y).

The effective number of digits for , kand on is 10.

(1) SEXAGESIMAL --- DECIMAL CONVERSION

The me key converts the sexagesimal figure (Degree, Minute and Second) to decimal scale.

EXAMPLE

OPERATION

READ-OUT

63°52'41"=63.87805555....°

63525415

63.87805555

(2) TRIGONOMETRIC FUNCTION

The \sin , \cos and \cos keys obtain each trigonometric value of the entry. In case the degree is given on the sexagesimal scale, it is necessary to convert the figure to the decimal scale before performing the trigonometric functions. Input range: $\sin x/\cos x/\tan x$; $|x| \le 1440^\circ$ (8 π rad, 1600 gra)

OPERATION

READ-OUT

sin63°52'41"

= 0.89785901

"DEG"

6311521141111111

0.89785901

 $\cos(\frac{\pi}{3}\text{rad}) = 0.5$

"RAD"

团第3日

0.5

tan(-35gra)=-0.61280079

"GRA"

35河區

-0.61280079

2sin45°×cos65°=0.597672473

"DEG" 2图45题图65篇

0.597672473

(3) INVERSE TRIGONOMETRIC FUNCTION

The received key performs each inverse trigonometric function in combination with the sin, was or received key.

Input range:

 $\sin^{-1} x / \cos^{-1} x$; $|x| \le 1$ $\tan^{-1} x$; $|x| < 1 \times 10^{100}$

EXAMPLE

OPERATION

READ-OUT

sin⁻¹0.5=30°

"DEG"

- 5 = €

30.

 $\cos^{-1}\frac{\sqrt{2}}{2} = 0.78539816 \text{ rad } (= \frac{\pi}{4}\text{rad})$

"RAD"

2月日2日阿四

0.78539816

÷ 72 =

0.249999998

tan-1 0.6128=31.499967° (=31°30')

"DEG"

⊡6128ஊ

31.499967

■31図60目

29.99802

sin-10.8-cos-10.7=7.557106°

"DEG" • 8 @ Sin ■ • 7 @ 6 = 5

7.557106

(4) LOGARITHMS

The key obtains the common logarithms of the number displayed. The key obtains the natural logarithms of the number displayed.

Input range: $0 < x < 1 \times 10^{100}$

EXAMPLE

OPERATION

READ-OUT

log123=log10123=2.0899051

123 🗐

2.0899051

In90=loge 90=4.4998097

90m

4.4998097

log456÷In456=0.434294475

0.434294475

(5) EXPONENTIATIONS

The $\overline{\mathbb{G}}$ key raises the constant 10 to x powers.

The e^x key raises the constant e (base) to x powers.

In another words, this is to obtain antiloge X.

The x'' key raises x to y powers. The number displayed when the x'' key is

used, is an intermediate result.

Input range: 10X; |x| < 100

 e^{x} ; $|x| \leq 230$

 x^y ; $0 < x < 1 \times 10^{100}$

EXAMPLE O	PERATION	READ-OUT
$10^{123} = 16.982437$	1 ⊡ 23 127	16.982437
$e^{45} = 90.017131$	4 ⊡ 5 🖭	90.017131
$2.3^{5.6} = 106.09035$	2 ⊡ 3 🗹 5 🖸 6 🖻	106.09035
$(78-23)^{-12} = 1.3051118 \times 10^{-21}$	78 3 23 1 2 1 2	1.3051118-21
$4^{2.5} = 32$	2 5 5 2 2 4 5	32.
$0.16^{2.5} = 0.01024$		0.01024
$5.76^{2.5} = 79.62624$	5⊡76⊟	79.62624
$3^{12} + e^{10} = 553467.466$	321211021	553467.466

(6) SQUARE ROOT & RECIPROCALS

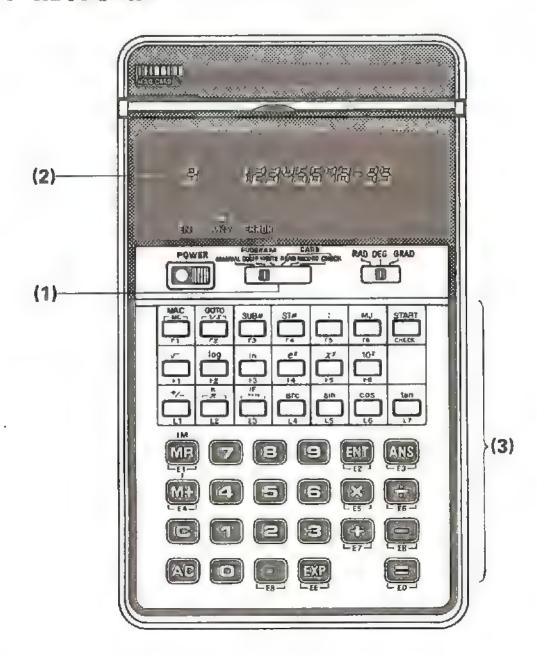
The 🔄 key extracts the square root of the number displayed.

EXAMPLE	OPERATION	READ-OUT	
$\sqrt{2} + \sqrt{3} = 3.146264369$	27+37=	3.146264369	
$\frac{1}{5+\frac{1}{3}}$ =0.1875	5 + 3 图 = 图	0.1875	
$\sqrt[7]{123} = 123^{\frac{1}{7}} = 1.9886478$	1232712	1.9886478	

PART-2 How to perform program calculations

Program calculation is explained in Part 2. Whether or not a program is convenient is determined by the program content. Since programming is all based on theory, perfect understanding of the basic principles allows better programming and more efficient use of this calculator.

2-1. KEYBOARD





(1) PROGRAM SWITCH

MANUAL (Manual mode) ...Set to this position for manual calculations where a program is not used. This position will be indicated by < MANUAL> in this instruction manual.

COMP (Compute mode) ... Set to this position to perform calculations using a program.

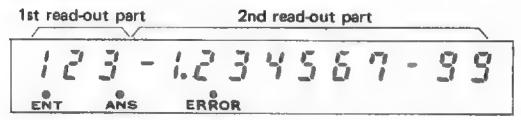
Indicated by <COMP>.

WRITE (Write mode) Set to this position when storing a program in the calculator, or to check a stored program.

Indicated by <WRITE>.

Note: When the or we key is depressed immediately after the program switch position is changed, 0.0000 way appear in the read-out. Subsequent calculations, however, can be made correctly.

(2) READ-OUT:



* 1st read-out part the first 3 digits of the read-out display program step numbers or data memory number.

* 2nd read-out part displays entries, answers, or the program contents as code number or values. "—" also lights in the first column when the calculator is calculating.

* ENT (entry) lamp This lamp lights together with the display of the memory number when waiting the input of program data. Indicated by

* ANS (answer) lamp This lamp lights together with the memory number when an answer to a program calculation is displayed. Indicated by (iii)

The operation of the angular mode selector is the same as for manual calculations.

(3) OPERATION KEYS:

DATA ENTRY KEY:

<WRITE> mode Use to write in data input messages.
<COMP> mode Use to advance the program by the operation Data

ANSWER KEY: ANS <WRITE> mode Use to write in answer display messages. <COMP> mode Use after reading out an answer to advance the program. MEMORY ALL CLEAR KEY (MC): MAC <WRITE> mode Use to write in a clear command for the 10 data memories and I-memory. <COMP> mode Clears 10 data memories and I-memory. It works as independent memory clear (MC) only in the <MANUAL> mode. GOTO KEY (区): GOTO <WRITE> mode.....Use to write in unconditional jump commands. <COMP> mode.....Works as ⅓ (reciprocal key). SUBROUTINE KEY: SUB# <WRITE> mode Use to write in subroutine programs. <COMP> mode No command. STATEMENT NUMBER KEY: ST# <WRITE> mode Use to write in the address to which both conditional and unconditional jumps are made. <COMP> mode No command. **MESSAGE END KEY:** <WRITE> mode Use to divide formulas and messages in programming. <COMP> mode No command. MANUAL JUMP KEY: MJ <WRITE> mode Use to write in MJ commands in programs. <COMP> mode Use during execution of a program to make a jump at the MJ position in the program. CHECK KEY (START KEY): CHECK <WRITE> mode Use when advancing a written program ahead 1 step (called program check). Shown as (MR in this manual. <COMP> mode Use to start a program calculation (to read the program from the first step). Shown as [1] in this manual. CONSTANT WRITE-IN KEY (元): K <WRITE> mode Use to write in constants in a program. <COMP> mode Works as a ∞ (Pi) key. IF KEY (Pm): [IF] WRITE> mode Use to write in conditional jump commands. <COMP> mode Works as a (Sexagesimal → decimal conversion key.) INDIRECT KEY (): <WRITE> mode Use to write in the command to store a value in

the I-memory

<COMP> mode No command

INDIRECT MEMORY KEY (III):

WRITE> mode....Use to write in the command to indirectly address the values stored in the I-memory during calculation.

<COMP> mode No command.

It works as MR (Independent memory recall) only in <MANUAL> mode.

CLEAR KEY:

<WRITE> mode.....Use to back up a written program one step and clear.

<COMP> mode Use to clear displayed data or answers.

ALL CLEAR KEY:

<WRITE> mode Use to erase a written program.

<COMP> mode....Use when desired to stop a program calculation.

2-2. INTERNAL MEMORIES (FOR USE WITH PROGRAM CALCULATIONS)

Arithmetic oper	ations register	
Function calcula	ations register	
Independent me	emory 1	can not
Data memory	1	calculat
Data memory	9 } 10	during o
Date memory	0)	during
I-memory	1	for indi
Program memor	y (127 steps)	only 1 stored.

. can not be used in program

.. for storing data and answers during calculations

.. for indirect address indication, only 1 digit (1~9, 0) can be stored.

2-3. PROGRAM STEPS AND COMMAND CODES

When the program switch is set at <WRITE> position, step numbers and command codes are displayed to indicate what step up a program is being written in or during check to indicate what step belongs to what command, etc.

* Step number.... Displayed in the 1st read-out part.

Steps are normally counted using one key for each step.

Command code . . . Three steps are displayed simultaneously in the 2nd read-out part. Command codes are written below the command keys and consist of symbols (Γ, \vdash, L, E) and numerals $(1\sim9, 0)$.

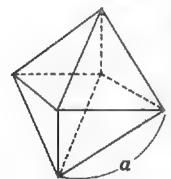
For example:

2-4. EXPLANATION OF BASIC PROGRAMS

- * The steps for using a program to make a calculation are as follows.
 - (1) Investigate the problem and determine the formula to be used.
 - (2) Make a program for the formula (Programming).
 - (3) Store the program in the calculator (Writing in).
 - (4) Use the stored program to make the calculation (Program calculation).

EXAMPLE: To find the surface area and volume of a regular octahedron with 10 cm sides. With 7 cm sides?

With 15 cm sides?



Length of side (a)	Surface area(s)	Volume(v)
10 cm	(346.4101614) cm ²	(471.4045206) cm ³
7	(169.740979)	(161.6917505)
15	(779.4228631)	(1590.990256)

(1) Formula: Syrface area = S; Volume = V; Length of side = a.

Therefore,
$$S = 2\sqrt{3}a^2$$
, $V = \frac{\sqrt{2}}{3}a^3$

- (2) Programming:
 - a. Each item of the formula will correspond to data memory number (1)~(9),(0).

Surface area S in memory 1 Volume V in memory 2

Length of one side a in memory (3); therefore

S =
$$2\sqrt{3} a^2$$
 becomes 1 = $2 \times \sqrt{3} \times 3 \times 3$;

and,
$$V = \frac{\sqrt{2}}{3}a^3$$
 becomes $2 = \sqrt{2} \div 3 \times 3 \times 3 \times 3$.

These formulas can be used without change in the program, except that K must be placed before the constants 2 and 3 stored. Consequently, the program will be:

 $1 = K2 \times K3 \sqrt{\times 3 \times 3}$:

(1) (S) is the constant 2 multiplied by the square root of 3 and this multiplied twice by (3) (a).)

 $2 = K2\sqrt{\div} K3 \times 3 \times 3 \times 3 :$

- (2(V) is the square root of the constant 2 divided by the constant 3 and this multiplied by 3(a) three times.)
- b. The data to be input into the formula are:

the length of one side a, so write:

ENT 3: (input is 3 (a).)

- * "ENT n₁: n₂:..." are called data input message (ENT message).
- c. Which are the answers to the calculations?

The answers are S (surface area) and V (volume) so write:

ANS 1 : 2 : (answers are 1)(S) and 2(V).)

* "ANS n₁: n₂:.." are answer display messages (ANS messages).

The basic programming sequence is:

- 1. ENT message
- 2. Calculation formula
- 3. ANS message.

When we place the above programs in correct sequence for programming we get:

ENT 3:

 $1 = K 2 \times K 3 \sqrt{x} 3 \times 3$:

 $2 = K 2\sqrt{+} K 3 \times 3 \times 3 \times 3$:

ANS 1:2:

(3) Writing in programs:

To write a program into the calculator:

- 1. Set the program switch at <WRITE>.
- 2. Key-in the program in correct sequence.
 (To erase a previously stored program, press after setting at

<WRITE>.)

OPERATION	READ-OUT	REMARK
	0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	(Progarm clear, O displayed). (Step No.1, 1) (Step No.2, value 3) (Step No.3, 1)

OPERATION	READ-OUT					REMARK
	1	004	3	Γ5	1	(Step No.4, value 1)
		005	Γ5	1	EO	(Step No.5, 😝)
	K	006	1	EO	L2	(Step No.6, K)
	2	007	EO	L2	2	(Step No.7, value 2)
	×	800	L2	2	E5	(Step No.8, ☑)
	K	009	2	E5	L2	(Step No.9, K)
	3	010	E5	L2	3	(Step No.10, value 3)
		011	L2	3	F1	(Step No.11, 🕝)
	\times	012	3	-1	E5	(Step No.12, 🖾)
	3	013	F1	E5	3	(Step No.13, value 3)
	×	014	E5	3	E5	(Step No.14, ☑)
	3	015	3	E5	3	(Step No.15, value 3)
		016	E5	3	Γ5	(Step No.16, :)
		017	3	Γ5	2	(Step No.17, value 2)
		018	Г5	2	EO	(Step No.18, ☐)
	K	019	2	EO	L2	(Step No.19, K)
	2	020	EO	L2	2	(Step No.20, value 2)
		021	L2	2	F1	(Step No.21, 🕝)
		022	2	F1	E6	(Step No.22, 📳)
	K	023	F1	E6	L2	(Step No.23, K)
	3	024	E6	L2	3	(Step No.24, value 3)
	×	025	L2	3	E5_	(Step No.25, 🔀)
	3	026	3	E5	3	(Step No.26, value 3)
	×	027	E5	3	E5	(Step No.27, 🔀)
	3	028	3	E5	_ 3	(Step No.28, value 3)
	×	029	E5	3	E5	(Step No.29, 🖾)
	3	030	3	E5	3	(Step No.30, value 3)
		031	E5	3	Γ5	(Step No.31, :)
	ZMS	032	3	Г5	E3	(Step No.32, 🝱)
	1	033	Γ5	E3	11	(Step No.33, value 1)
		034	E3	1	Γ5	(Step No.34, 🔃)
	2	035	1	Γ5	2	(Step No.35, value 2)
		036	Γ5	2	Γ5	(Step No.36, 🗈)

This completes the programming.

In the <WRITE> mode, each time a key is pressed, that command is stored in the memory as a program. The number of step and the code number of the command written in, together with the code number of the previous

two commands, are displayed simultaneously in the read-out.

(4) Program calculation:

To perform a calculation using the program:

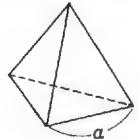
- Set the program switch at <COMP> position.
 (When using a program including trigonometric or inverse trigonometric functions you must also set the angular mode selector as required.)
- 2. Press the Ma key.
- 3. When the me lamp lights, input the required data for the indicated memory number and press memory number and num
- 4. The answer is displayed by the memory number when the lamp lights. (After reading out the answer, press or to advance the program.)
- 5. Press [STA] if desired to repeat the program calculation.
- 6. Press (ac) to stop the program calculation.

OPERATION	READ-OUT	REMARK				
Program switch at <comp></comp>	© 3 0. → Memory ③ (a) inpu	l t				
10 🖼	<u>1 346.4101614</u>]				
(To advance the	→ Memory ①(S) answ	ver				
program)	as 2 471.4045206]				
(To repeat the	→ Memory ② (V) answer					
calculation)	(BI) 3 O.] (Memory ③ input)				
(If one side = 7cm) 7 💷	® 1 169.740979] (Memory ① answer)				
AKS	(MS) 2 161.6917505	(Memory ② answer)				
STA	® 3 0.					
(If one side = 15 @	66 1 779.4228631					
15 cm) 🚾	© 2 1590.990256					
(Program calculation (C	0.					
completed)						

In program calculations, one advances in accordance with the lamps and the memory numbers displayed in the 1st read-out part to find the solution to the problem. The program can be advanced using either the solution to keys.

2-5. HOW TO CHEK, ERASE AND CHANGE PROGRAMS

EXAMPLE: To find the surface area and volume of a regular tetrahedron with sides 10cm long. If sides are 7.5cm? If sides are 20cm?



Length of side (a)	Surface area(s)	Volume(v)
10 cm	(173.2050807) cm ²	(117.8511301) cm ³
7.5	(97.42785789)	(49.71844553)
20	(692.8203228)	(942.8090412)

(1) Formula: Surface area = S; Volume = V; Length of side = a;

therefore, $S = \sqrt{3}a^2$, $V = \frac{\sqrt{2}}{12}a^3$

(2) Programming: S in memory 1; V in memory 2; a in memory 3; therefore. ENT 3:

efore, ENT 3: $1 = K3\sqrt{x}3x3$:

 $2 = K2\sqrt{\div K12 \times 3 \times 3 \times 3}$:

ANS 1:2:

This program may be written into the calculator from the beginning but it closely resembles the octahedron program on page 17 so that program can be revised if the methods of program checking, erasing, correction, etc., are understood.

(3) Program check and changes:

Program check is recalling the program written into the program memories to the display to confirm the contents. Each time the key is pressed in the <WRITE> mode, the step numbers and contents are displayed one at a time, just as when the program was written.

The required steps are displayed in program check also to make use, erase or change previously stored programs.

If we compare the two programs:

- A. Erase the 2nd item "K2 x" of the octahedron program.
- B. Change the octahedron program from the 3rd item " $K2\sqrt{\div}$ K".

OPERATION	 READ-OUT			REMARK	
Program switch at <write></write>				0.]
at \While>	001			E2] (Step No.1, 🖽)
	002		E2	3	(Step No.2, value 3)
	003	E2	3	Г5	(Step No.3, 🗈)
	004	3	Γ5	1	(Step No.4, value 1)
	005	Γ5	1	EO	(Step No.5, 😑)
	006	1	EO	L2	(Step No.6, K)
				L	Erase this.

1

036

Γ5

(Look at the start of O39 F5 OO OO (Step No.39, no command) the program)

No parts of the program are displayed as no

command (00).

(Step No.36, value 2)

This completes the changing of the program.

2

Making a program check:

1. Set the program switch at <WRITE>.

- 2. Each time is depressed, step numbers and command codes are displayed for confirmation. (Steps containing no command are displayed as "00" or blank.)
- * In order to make an addition to a program already written in, erase the command in the step where the addition is to be made and write in the new command by pressing the proper keys. Previous programs can be used when steps are erased or the number of steps is reduced but when the number of steps is increased the point from where the addition starts to the end must be written in again.

How to erase and change programs:

- 1. Advance to the required step using program check.
- 2. Display the command to be erased and press .

 (Using , at the time the program is backed up the command that leaves the display is erased and becomes no command.)
- 3. Display the step just before the one to be changed and then write in the altered program.
- 4. For corrections, display the step just before the one to be corrected and write in the new command.
- * Program calculations except the message (IF M = m : A : B : C :) are not affected even if erased steps are in the middle of a program.

(4) Program calculation

OPERATION		REAL	D-OUT	REMARK
Program switch	\$TA	@ 3	0.	(Memory③(a) input)
at <comp></comp>	10 🖽	(AB) 1		(Memory (1)(s) answer)
	ANS	(46) 2] (Memory@(V) answer)
(To repeat the	STA	(BIT) 3	0.] (Memory(3)(a) input)
calculation)		The fol	llowing is omited.	

2-6. PROGRAMMING RULES

- * There are basic programming rules. Calculations cannot be performed if these rules are not observed.
- 1) Data input message (ENT message)
- The format is I Ma : Ma : Ma :
- M₁, M₂, M₃, etc., are memory numbers 1 ~ 9, 0 and I, IM.
- The sequence of memory numbers and I, IM are not determined.
- When inputting data into the memory, the previously stored values are erased and the new values entered.

2) Calculation message

- In function calculations, the function command must be written in after the function data memory number, as in [1] [2] [3] [3].
- M₁, M₂, etc., are the same as ENT messages. Constants can also be used after \blacksquare .
- Calculations are made from the left of \square to the right, regardless of the importance of \square \square \square in the calculation message and the answer is put into the memory before \square .

Example: When the memory contents are 2 = 10.1, 3 = 0.81, and 4 = 8, $(10.1 + 0.81) \times 8 - 10.1$ is calculated on the formula $1 = 2 + 3 \times 4 - 2$; and the answer 77.18 is put into memory 1.

- and function commands are calculated immediately and used in arithmetic operations. (x^y is the same as an arithmetic operation.) Example: When memory contents are 0 = 1000, 2 = 30, and 4 = 2 (with "DEG"), ($\sin 30^\circ \times \log 1000$)⁻² is calculated on the formula $7 = 2 \sin \times 1 \log x^y + 1$ and the answer 0.444... is put into memory 7.
- The contents of the memories used in the calculation are not changed, excluding the memory to the left of
- There is no limit to the length (number of steps) of a calculation message.
- Complex formulas can be broken down into several simpler formulas.

Example:
$$x = \sqrt{\frac{(AxB)+(CxD)}{B+D}}$$

A in memory ① D in memory ② x in memory ③ x in memory ④ x in mem

- Any number of constants can be used in one calculation message but one constant is limited to a 10-digit value.
 (When is used, the mantissa is 8 digits and the exponent 2 digits.)

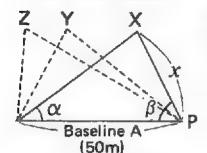
When multiple calculation commands and function commands are assembled continuously, calculations are made in the same way as in manual calculations.

3) Answer display message

- The format is MI : MR : MS :
- M1, M2, M3, etc., are the data memory numbers ($① \sim 9$, ②) and IM. (ANS I: is impossible.)
- The sequence for getting the answer is not determined.

2-7. HOW TO USE THE MJ (MANUAL JUMP)

Example: In triangle mensuration, with a baseline of 50m, find the angles to points X, Y and Z. What are the distances in meters of PX, PY and PZ shown in the table below?



Point	Baseline A	Angle &	Angle β	Distance x
Χ.	50 m	41°	76°	(36.815) ^m
Y	50	61°32′	49°25′	(47.066)
Z	50	50°06′03″	37°53′	(38.382)

(1) Formula:

$$x = \frac{Ax \sin \alpha}{\sin (180^{\circ} - \alpha - \beta)}$$

(2) Memory: Baseline A in memory 1

ENT 1:

Angle α in memory 2Angle β in memory 3

Angle $(180^{\circ} - \alpha - \beta)$ in memory 4

Distance x in memory (5)

(3) Programming:

MJ ENT 2:3: 4 = K180-2-3: 5 = 1x2 sin ÷ 4 sin: ANS 5:

In this program it is necessary to input the baseline length for each calcualtion.

Make in this way.

(4) Program calculation:

OPERATION

RAED-OUT

REMARK

Program switch at <COMP>

TTA ENT	1 0.	(A input)
50 ETT (ERT)	2 0.	(α input)
41 🖽 🕮		$] (\beta input) $
76 m (48)	5 36.81561331	(Distance PX)
MU (DA)	2 0.] (α input)
- lum	n to the MI of the n	rograma wish abi-

→ Jump to the MJ of the program with this key.

61 32 11	@m 3	0.	
49-25-6	46 5	47.06613813	(Distance PY)
STA	an 1	0.	
L _{>}	TA is to	ouched by error.	
	en 2	0.	
L _{>}	Jump t	o MJ with memory	1 as it is.
50~6~3~ 1	E 1	0	
37535 💷	us 5	38.38247737	(Distance PZ)
(Program calculation completed)		0.	

* If the baseline changes input from the start with MA, and if the baseline is the same input from the angle using MA.

MJ

1. If we is pressed when a program is stopped (with en, wes) while performing a calculation, a jump is made up to the written in we (both backward and forward).

2. When more than one was are written in, the jump is made to the final

one and the others are ignored.

3. If Mu is pressed when Mu is not written into the program, the program will not operate correctly.

2-8. PROGRAM TO FIND TOTALS (∑)

Example: There are several triangles, the lengths of the sides of which we know. Find the area of each triangle and the total area.

Triangle	Side a	Side b	Side c	Area S
A	12 ^m	15 ^m	19 ^m	(89.977) m ²
В	19	18.5	25	(174.657)
С	25	14	21.3	(148.972)
			Total	(413.607)

(1) Formula:

$$S = \sqrt{S(S-a) (S-b) (S-c)}$$

$$S = \frac{a+b+c}{2}$$

(2) Memory: a in the memory(1) S in the memory(4) b in the memory(2) (S-a) in the memory(9) c in the memory(3) (S-b) in the memory(8) S in the memory(1) (S-c) in the memory(7) values within the radical \rightarrow (6)

In programs for totaling we indicate the memory used for totaling by M and the totaled memory as m, so we get M = M + m:

This means that the M to which a new answer with m is added becomes a new M. O must always be placed before M. To make M into 0, assemble as M = K 0: or else use . Thus, if we put the total area of the above calculation in memory (5):

(3) Programming:

```
MAC
ENT 1:2:3:
0 = 1 + 2 + 3 \div K2:
9 = 0 - 1:
8 = 0 - 2:
7 = 0 - 3:
6 = 0 \times 9 \times 8 \times 7:
4 = 6\sqrt{:}
ANS 4:
5 = 5 + 4:
ANS 5:
```

The program calculation with this program is:

```
<COMP>
                   STA
           side (a) III
           side (b) Em
           side (c) \square \rightarrow Area display
(To get the total-
                   ANS → Total area?
     ing program)
                            (ANS 5: to be read)
(To calcuate the STA)
following triangle) - The first we is read and
                       the total becomes 0.
                       (wrong program).
```

Here we vary the program sequence and use [4].

```
MAC
MJ
  ENT 1:2:3:
  0 = 1 + 2 + 3 \div K2:
  9 = 0 - 1:
  8 = 0 - 2:
  7 = 0 - 3:
  6 = 0 \times 9 \times 8 \times 7:
  4 = 6J:
  5 = 5 + 4:
 ANS 4:5:
```

The calculation using this program is:

```
<COMP>
           side (a) IIII
           side (b) III
           side (c) \square \longrightarrow Area display
                    → When there is
                                            (Repeat
One or the other
                     following
                                      MJ ... from
                     triangle
                                            side(a) \square
                    >When giving
                                                Total
                     total
                                      ANS → area
```

When calculating another group of triangle,

> read MAC and the total becomes 0.

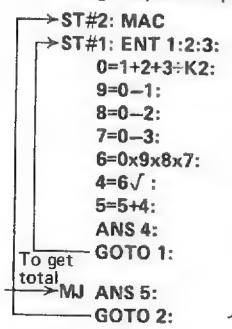
How to perform totaling calculations

- Prepare memory M for use in totaling. M = M+m: or M = m+M: is used. (m is the data or answer memory.)
- This totaling use memory must be made 0 before starting the totaling.
- 3). How to make the totaling memory 0.
 - a. Do not include a clear command in the program but press the key before entering the first data of the calculation.
 - b. A clear command such as we, etc., is included in the first part of the program and below the 2nd line is not red. There are also methods using MJ or com (com is explained below.).

2-9. HOW TO USE GOTO and ST# (UNCONDITIONAL JUMP)

The program given above for finding the total surface area of triangles involves pressing MJ once for each triangle to make a jump to after MD but, instead of pressing the key, if the ©000 command and STH are programmed in front of the jump this can be done automatically without pressing MJ each time. This is an unconditional jump. By adding memory numbers after G000 and STH up to 10 jumps can be programmed.

Altering the previous program.



The calculation using this program is: <COMP> side(a) W side(b) W side(c) W → Area display (Repeat from (To advance the program) the input of side (a)) (When finding the total) MJ → Total area (Repeat from (To advance the program) the input of side (a)) In this program calculation, press the keys in accordance with the indications of the displayed (ENT), (ANS) lamps. If the (MJ) key is considered the total key, anyone can understand the procedure and perform the calculations.

GOTO ST#

1). By putting in GOTO N:a jump can be made to the program ST#N:.

2). N is a natural number from 1 to 9, 0.

GOTON:, and ST#N: can be added at any position in the program.
 A maximum of 10 jumps can be used in accordance with the N number.

 GOTO N1: is effective no matter how many times used but ST#N1: can only be used once. (When ST# N1: is used more than once, only the last is effective.)

5). When there is no ST# N1: to correspond to GOTO N1: the program calculation is stopped.

2-10. HOW TO USE F (CONDITIONAL JUMP)

Example: To calculate the square root of the quadratic equation $ax^2 + bx + c$ = 0. The way the answer is shown will differ depending on the formula used.

- 11	Coefficient			Answer
Problem	а	b	С	7,410
$8x^2 + 6x + 1 = 0$	8	6	1	(-0.25, -0.5)
$2x^2 - 28x + 98 = 0$	2	-28	98	(7)
$2x^2 + 26x + 89 = 0$	2	26	89	$(-6.5 \pm 1.5i)$

1) Formula:

$$x = \frac{-b \pm \sqrt{D}}{2a}$$

$$D = b^2 - 4ac$$

2) Memory:

Coefficient a) in memory ①

b) in memory 2

c) in memory 3

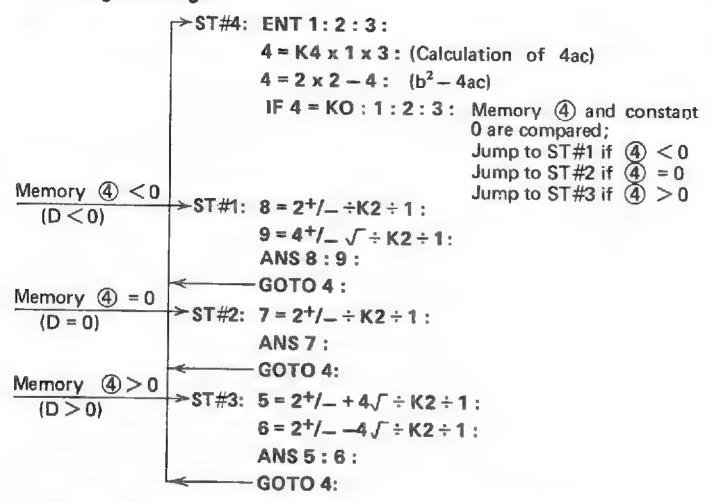
Separate formula D in memory 4

Answer (actual root) in memory (5), (6)

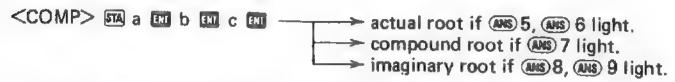
Answer (compound root) in memory
Answer (imaginary root) { real number part in memory (9) | imaginary number part in memory (9)

* The conditional jump is jumping to a different place in accordance with the conditions after comparing the size of the values. If and III are used. Conditional jump is IF M = m : A : B : C :. This compares M and m, when M is less than m the jump is to ST#A; when M = m the jump is to ST#B; and when M is larger than m the jump is to ST#C.

(3) Programming:



(4) Program calculation:



* In any case, the answer can be displayed merely by advancing the program. If advance is continued, a return is made to input of the coefficient a) with 1.

(IF)

- 1. By programming IF M = m : A : B : C : , the place to which a jump is to be made can be made by comparing M and m. If M<m the jump is to ST#A; if M = m the jump is to ST#B; if M>m the jump is to ST#C.
- M and m are data memory numbers, I, IM and constant. A, B and C are natural numbers 1~9,0. If M becomes a negative number when m is a positive constant or I, program IF m = M : A : B : C :.
- 3. When M≤m, A and B are the same values; when M≤m, B and C are the same values. A, B and C are written in.
- 4. A, B and C can be the same as the ST# for GOTO.
- 5. When calculations are performed without a jump destination, the program calculation is stopped.

2-11. HOW TO USE I AND IM (INDIRECT ADDRESS)

Example: There are 9 items from A to I. Data is input in sequence starting with A. While the data is stored it is also totaled.

Item	Data		
Α	25.3		
В	63.7		
С	6.0		
D	57.9		
Е	70.6		
F	15.2		
G	50.8		
Н	41.5		
1	32.1		
Total	363.1		

(1) Formula: Omitted

(2) Memory: A data in the memory ①
B data in the memory ②
C data in the memory ③

I data in the memory

Data total in the memory

10

(3) Programming:

MAC (To get total)

ENT 1: 2: 3: 4: 5: 6: 7: 8: 9:

0 = 1 + 2 + 3 + 4 + 5

+6+7+8+9:

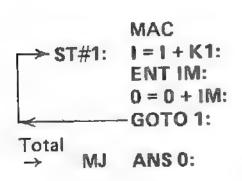
ANS 0:

This program is arranged in memories ① through ② so count is performed from 1. If the count number is made the same as the memory number it is simpler. The I-memory performs the count. The IM command is used to employ the count number as the memory number. In other words, the number of the memory to be used is put into the I-memory and, during the calculation, IM is used instead of that number.

For example, I = K5:

 $1M = 2 \times 3$: is the same as $5 = 2 \times 3$:

Or, with I = I + K1: the I memory counts 1 for each time the program is read Therefore, the previous program is written as:



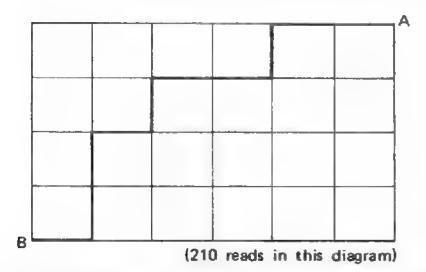
- All memories, including II., cleared with III.
- ! = ! + K1 : and (0 + 1) is put into the I-memory
- Since 1 is in the I-memory, ENT IM: is the same
 as ENT 1: and 0 = 0 + IM: is the same as 0 + 1:
- The 2nd time 1 is in the I-memory so I = I+K1; is put into the I-memory as (1 + 1)
- 1 is 2 so ENT IM: is the same as NET 2:. Also,
 0 = 0 + IM: is the same as 0 = 0 + 2:.
- The following is the same until Mu is pressed.

- 1 and M
- 1. When the memory number of the memory to be used is put into the I memory, IM can be used instead of that number.
- 2. The I memory stores the natural numbers 1~9, 0. For other values only the first digit is stored (1 if 10).
- 3. When the calculator reads ENT I:, the ENT lamp and "E" light up on the 1st read-out part (this is not an error).
- The message ANS I: can not be programmed.

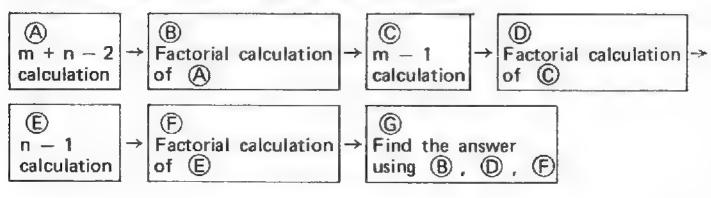
2-12. HOW TO USE (SUB#) SUBROUTINE

Example: There are m parallel roads going east and west and n going north and south. In going from northeast corner A to southwest corner B how many roads will be used if the shortest path is taken?

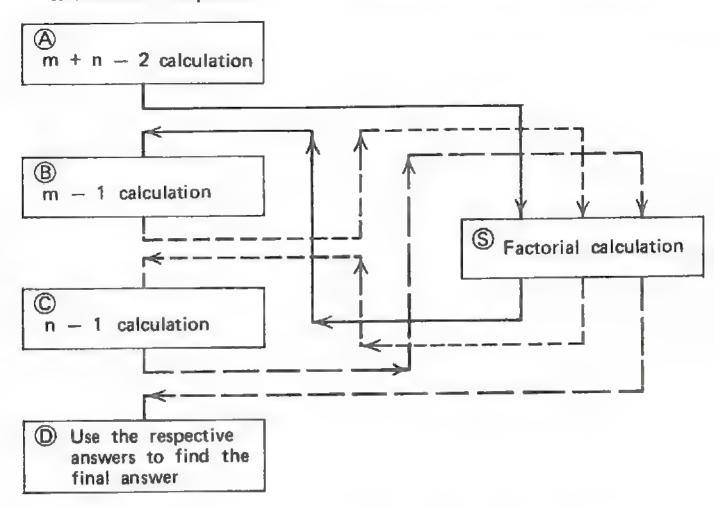
- (1) Formula: Numbers to be assembled = $\frac{(m+n-2)!}{(m-1)! \times (n-1)!}$
- (2) Memory: m in the (m-1)! in the (m+n-2) in the memory $\boxed{5}$ memory $\boxed{1}$ memory $\boxed{3}$ n in the (n-1)! in the Answer in the memory $\boxed{6}$ memory $\boxed{2}$ memory $\boxed{4}$



* This calculation is normally performed as follows.



* The same calculation can be performed by making only the factorial calculations independent.



As shown in this diagram, the flow $\textcircled{A} \rightarrow \textcircled{B} \rightarrow \textcircled{C} \rightarrow \textcircled{D}$ is called the main routine. Parts made independent, such as S, and used as required in the main routine are called subroutines.

```
Program to find the factorial n! (n \rightarrow memory \textcircled{0}, answer \rightarrow \textcircled{9})
                                         (Data n in memory (1))
                ENT 0 :
                                         (First enter 1 in the answer)
                9 = K1 :
                                         (If n is larger than 1, to ST#9; if n = 1
                IF0 = K1:0:0:9:
    ≻ ST#8:
                                         or n<1, to ST#0.)
                                         (Multiply the answer by n)
               9 = 9 \times 0:
      ST#9:
                                         (n reduced by 1)
                0 = 0 - K1:
                                         (To ST#8 = repeat)
               - GOTO 8:
                                         (Answer display)
      ST#0:
                ANS 9 :
```

The above is a program for independent factorial calculations but, when this is put in a program as a subroutine, a subroutine number (SUB# N:) is added and it is put at the end of the main routine. When calling out a subroutine from the main routine, use GOTO N:.

When the following program (subroutine program) is executed to the end, SUB#N: returns automatically to the place where the main routine jumped.

(3) Programming:

►ST#2 : ENT 1:2: (m and n input) 0 = 1 - K1: $(m-1 \text{ in } \bigcirc)$ **GOTO 1:** (To subroutine) 3 = 9: (Answer to m — 1 factorial in (3)) 0 = 2 - K1: (n-1)(0)**GOTO 1:** (To subroutine) 4 = 9 :(Answer to n-1 factorial in (4)) 0 = 1 + 2 - K2: (m + n - 2 in (0))**GOTO 1:** (To subroutine) 5 = 9: (m + n - 2 factorial in (4)) $6 = 5 \div 3 \div 4$: (Calculation of combined numbers) **ANS 6:** (Display of answer of combined number) GOTO 2: (To start to repeat) 9 = K1:SUB#1: Subroutine program (Compared to the above, data is set by the main

taken.)

routine so ENT 0: is taken. The

answers to the respective factorials

need not be seen so ANS 9: is

ST#8 : IF O = K1:0:0:9: ST#9 : 9 = 9 x 0: 0 = 0 - K1: GOTO 8:

ST#0 :

2-13. PROGRAM CALCULATION

SUB#

- When SUB# N : is placed at the beginning of a program and that program is put at the end of a main program, it is called a subroutine program.
- 2. When it is desired to execute a subroutine program in a main program, assemble GOTO N:. The N number is the same as the N of SUB#N:. A conditional jump () can also be made to a subroutine.
- 3. Up to 10 subroutines can be assembled but the same number as the N in SUB# N : cannot be used.

(Consequently, state and susa together will total. 10.)

- 4. When a subroutine program has been executed (go to the next SUB#N: or read to the 127th step), an automatic return is made to the step after the one from which the main program jumped. (This is not ST#N:.)
- 5. The destination of 6000 and IF jumps in a subroutine are in that subroutine. The destination of a 6000 of IF jump by a main routine cannot be in a subroutine.
- 6. A subroutine cannot be called by another subroutine.
- * Special ways of using sum Using to make program additions.
- * When a change is made in a program already stored in the calculator, the number of steps is increased (insert no command 00 when the number of steps is reduced), or an addition is made to the program, we can use SUB# to avoid re-entering all of the program after the changed part. This is especially convenient when changes are made near the start of a long program.

The method

- 1. Change to GOTO N : one line before or after the addition. (When this 1 line is 3 steps or more, enter 00 in the remainder.)
- Write in the additional program at the end of the program, after SUB# N:
 Do not forget to enter the erased line at the beginning and end of the added part.

EXAMPLE:

ENT 1: 2: 3: Add
$$0 = 1 + 2 + 3 \div K2$$
:
$$\begin{cases} 6 = K2 \times 1 \times 2 \times 3 \cos 3 \\ 7 = 2 \times 2 : \\ 8 = 1 \times 1 + 7 - 6 : \\ 3 = 8 \sqrt{3} : \\ ANS 3: \end{cases}$$
ANS 5: GOTO 2:

Change or addition

- 1) Change ENT 1: 2: 3: to GOTO 0: and 4-step no command.
- Write from SUB# 0: ENT 1: 2: 3: to added program ----6=to ANS 3: after the final GOTO 2: of the program.

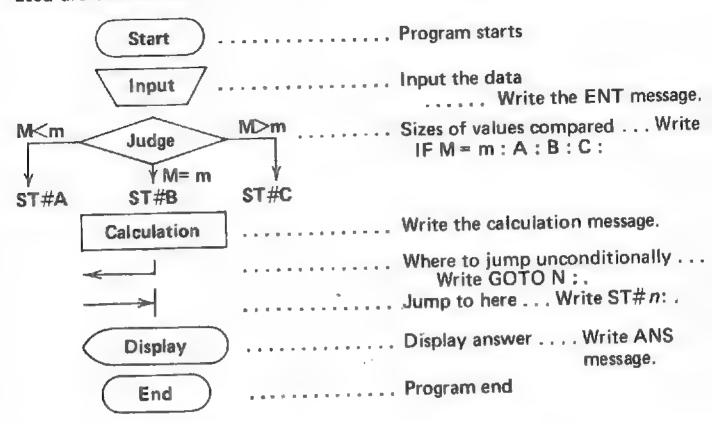
Note: The above change is made when the angle included by two sides (angle in memory ③ is included in the area calculation. The other side is displayed after the calculation and then the area is displayed.

2-14. OPERATION OF THE PROGRAM SWITCH AT <COMP>

- 1. When performing automatic calculations (program calculations) using a program stored in the calculator, the program switch must be set at COMP is pressed; otherwise, calculations will not be performed.
- 2. For program calculations either the (NT) or the (NS) lamp will light.
- 3. When AC is pressed in program calculation mode, the program preparation mode will first be entered and the A and keys will not operate. (The A and A lamps also go out.)
- 4. The program preparation mode is also entered when a program is executed breaking the programming rules.
- Manual arithmetic and function calculations are possible in either program mode or program preparation mode but the data memories and independent memory cannot be used.
 - (To see the contents of the data memories, set to <MANUAL>. Because we clears all the data memories in <COMP>, both the data and the answer are erased when it is pressed during a calculation.)
- 6. When an answer is displayed in the program calculation mode (ANS) lamp lit), an entry is made and a program executed, the content of the memory number changes to the entered value.

2-15. WRITING FLOW CHARTS

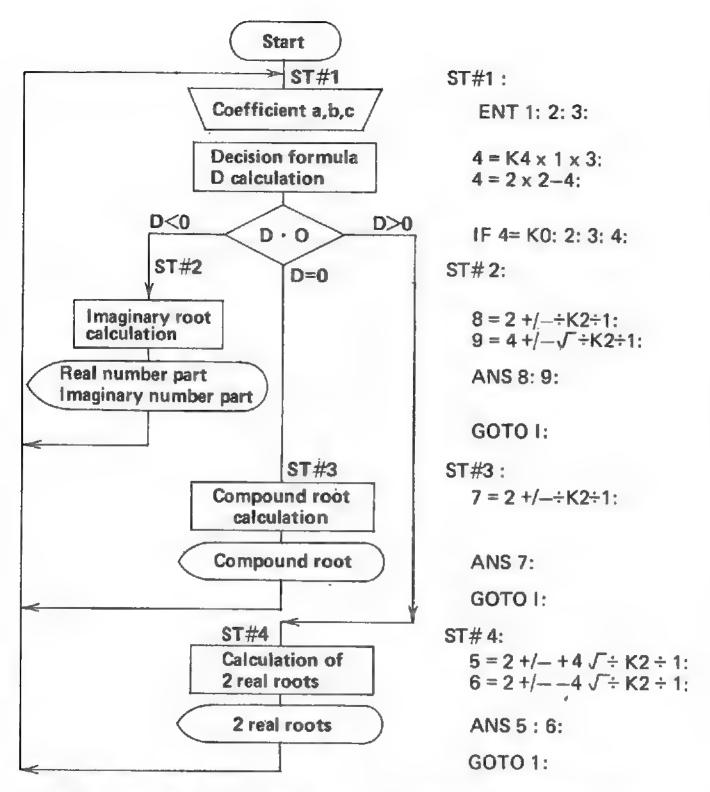
Programs are easier to write when the sequence of the calculation is arranged clearly. This calculation sequence is called the flow chart and the symbols used are determined.



The following is the flow chart for the equation on page 28.

Content of memories used

1 Coefficient a	
② Coefficient b	
3 Coefficient c	
Decision formula D	
Coefficient a Coefficient b Coefficient c Decision formula D Actual root	**
(7) Compound root	
Compound root B	



Note: Because the ST# go from above in sequence the contents are the same but this is not the samd as the program on page 29.

2-16. CONCLUSION

Program calculation sequence

1. Investigate the problem carefully and determine the formula required to obtain the answer.

Clarify the procedure required to obtain the answer to the calculation and write this procedure in a flow chart.

3. Program the formula following the flow chart. (Programming)

4. Check the program.

5. Write the program into the calculator (store in the calculator).

6. Check the program for errors.

7. Use the program to perform the calculation obtain the answer.

BASIC PROGRAM TECHNIQUE

1. Mixed calculation

Example (1).

When we advance one step the answer can remain in memory 1 so,

 $1 = 2 \times 3$:..... put 2 x 3 memory ①

1 = 4 x 5 + 1; put items added to (4) x (5) in (1) again in (1).

* In the basic form all the contents remain in the memories so there is the advantage of easy checking later.

Example (2).

Because memory 4 is not used this becomes $1 = 2 \times 3$: $1 = 1\sqrt{ }$:.

- * In extraction calculations, the root is stored in one of the memories.
- * The same for finding functions of a calculation result $(\log \frac{123}{456}, \text{ etc})$.

Example (3).

$$A = \frac{B}{C + D} \xrightarrow{2}$$
The basic $\begin{cases} 5 = 3 + 4 : \\ 1 = 2 \div 5 : \end{cases}$
Because memory $\begin{cases} 1 = 3 + 4 : \\ 1 = 2 \div 1 : \end{cases}$

$$\begin{cases} 1 = 3 + 4 : \\ 1 = 2 \div 1 : \end{cases}$$

* When the denominator is sum or difference this is put into the memory.

2. 109

Example (1)
$$x = A^2 \Rightarrow 5 = 1x^y \text{K2}$$
:

(5) (1)

* Rather than this program, $5 = 1 \times 1$: is easier to understand and there are few steps.

Example (2)

is used in the same way as the arithmetic operations so caution is required when assembling in continued calculations.

3. Totals, differences, etc. (Write as Σ)

$$9 = 9 + 1$$
: Sum of square value $\rightarrow 9 = 1 \times 1 + 9$:

 Σ memory Data or answer memory

* It is necessary to make the Σ memory 0 in the beginning.

4. Accumulation (Write as II)

$$\frac{9}{\uparrow} = \frac{9}{\uparrow} \times \frac{1}{\uparrow}$$

Data or answer memory

It is necessary to make the I memory I in the beginning.

5. Count

$$\frac{6}{7} = \frac{6}{7} + \frac{1}{1}$$

Count memory

Constant

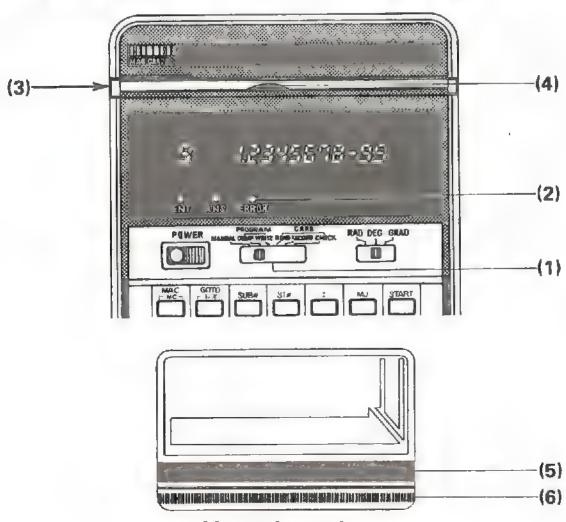
The number of counts can be checked with IF in repeat calculation, etc., when the repeat is automatically stopped after the required number of calculations.

PART-3 Card programs

In Part 3 we explain the magnetic cards which are a major factor in the superb convenience of the calculator.

If these magnetic cards are not used properly the ERROR lamp will light and operation will not be possible; therefore, study these instructions carefully before using the cards. Avoid use and storage in places where there is excessive heat or moisture as the performance may be adversely affected. (Permissible ambient temperature: -10°C to +45°C. 14°F to 113°F)

3-1. NAMES AND EXPLANATIONS OF PARTS REQUIRED FOR USE OF THE MAGNETIC CARDS.



(1) CARD MODE SWITCH

(CARD > CALCULATOR)

(CALCULATOR → CARD)

(CALCULATOR ←> CARD)

* READ (read mode) Set to this position to transfer a program from a magnetic card to the calculator program memory. Indicated by <READ> in this manual! * RECORD (record mode) . . . Set to this position to transfer a program from the calculator program memory to a magnetic card. Previously recorded program is erased and the new program (in the calculator) is recorded. Indicated by <RECORD>.

* CHECK (check mode) Set to this position to check whether the program on the magnetic and the program in the calculator are the same, Indicated by <CHECK>.

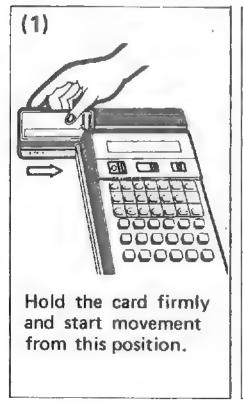
Note: Manual calculations are possible regardless of the position to which the card mode switch is set (same as at MANUAL) but power consumption is greater so do not set the card mode switch in the card mode except when using a card.

(2) ERROR LAMP

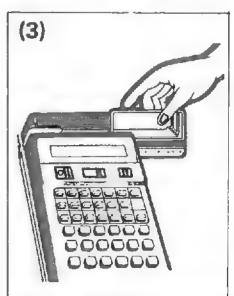
This lamp lights when the card is not moved through the card slot properly or when the calculator or card is not functioning normally. In this case the lamp continues to light until normal function is returned (it cannot be extinguished even by pressing the AC key). Causes of the lamp lighting are given on the page 43.

(3) CARD SLOT

This slot is for the purpose of guiding the travel of the magnetic cards. The card should be moved at a constant speed, as shown in the diagrams below,







The card will come out of the slot if moved this far while half of the slot.

(4) MAGNETIC HEAD

This head is extremely important in the transfer of data between the magnetic cards and the calculator. The function is greatly affected by soiling so clean the head once for every 100 times a magnetic card is used by passing the cleaning card through the slot.

(5) MAGNETIC STRIPE

The calculator programs are recorded here by means of the magnetic head (recording capacity is 127 steps). Therefore, programs become unusable if this area is soiled or damaged and the magnetic cards become useless.

(6) TIMING MARK

This mark establishes the timing for error-free recording of the calculator programs onto magnetic cards in the <RECORD> mode. New programs cannot be recorded on a magnetic card if the accessory protective tape is adhered to either side of this part. In other words, adhere the protective tape to the timing marks of the magnetic cards which you wish to use again. Recording is again possible when the protective tape is removed.

3-2. HOW TO RECORD FROM THE CALCULATOR TO THE CARD.

- 1. Set the Card Mode Switch to <RECORD>. (The display may be as before.)
- 2. Move the magnetic card (one without protective tape) through the slot as shown in the diagram on page 41.
- 3. Move the card through the slot again if the ERROR lamp lights.
- 4. Set the switch to <CHECK> in order to check whether the magnetic card was correctly recorded. To check, move the card through the slot.
- 5. The recording on the magnetic card is correct if the ERROR lamp does not light in the <CHECK> mode.
- 6. If the ERROR lamp should light, repeat the above steps.

3-3. HOW TO RECORD FROM THE MAGNETIC CARD TO THE CALCULATOR

- 1. Set the Card Mode Switch to <READ>. (The display may be as before.)
- 2. Move the magnetic card through the slot as shown in the diagram on page 41.
- 3. If the ERROR lamp lights, move the magnetic card through the slot again.
- 4. Set the swtich to <CHECK> and move the card through the slot so check whether or not it is correctly recorded.
- 5. If the ERROR lamp does not light in the check mode, the program is correctly recorded in the calculator.
- 6. If the ERROR lamp should light, repeat the above steps.

3-4. CAUSES OF THE ERROR LAMP LIGHTING AND COUNTERMEASURES

Mode Switch	Cause	Remedy
RECORD READ CHECK	* Card moved too fast. * Card moved too slow. * Card moved in wrong direction. * Card stopped before end. * Card not moved pararell. * Card inserted in middle, or removed before end.	Move the card correctly as shown in the diagram on page 41. (Correct speed: 10 - 80cm/sec.)
	* Card soiled, magnetic stripe bent or damaged.	Use a new card.
	* Magnetic head soiled.	Use the cleaning card.
RECORD	* Calculator program memory malfunctioning (when all empty steps are not 00).	Press the AC key in WRITE mode and correctly enter the program.
HEOGHO	* Protective tape is adhered.	Remove the tape.
CHECK	* The calculator and card programs are not the same.	Do again in <record> or <read></read></record>

Note: If the ERROR lamp does not go out once it has come on even through the above steps are taken (excluding turning the power switch off and on), manual and program calculations are still possible (if the calculator program is correct).

3-5. CAUTIONS IN USE OF MAGNETIC CARDS

- * Do not move the magnetic cards through the slot under strong illumination such as direct sunlight (especially avoid this in the <RECORD> mode).
- * Use care in storage and handling of the magnetic cards as the contents may be altered by temperatures in excess of -10°C to +45°C (14°F to 113°F) or by proximity to magnetic fields (magnets, etc.).
- * The magnetic cards are easily damaged so after use always place each one in an accessory paper case.
- * The magnetic head should be cleaned periodically (once for every 100 times the magnetic cards are used) or when it seems to be dirty (when the ERROR lamp occasionally lights) by running the cleaning card through the slot 2 or 3 times.
- * When properly stored, a magnetic card can be used up to approximately 1000 times. After this, use a new card.
- * The cleaning card cleans effectively approximately 200 times on each side (400 times in total).
- * When a magnetic card is moved through the slot in the <RECORD> mode, the power consumption is 3 times the normal consumption (0.5W). In this case, the display numerals may go out of a nearly exhausted battery is used. This is not a malfunction, as they will come again if the the power switch is turned off and then on again.

Reference programs

CASIO PRO fx-1 PROGRAM SHEET

rogram Name Classific	cation totals								Dé	ite		N	o. 1	l	
Formula (examples using actual va	alues are on	the					Me	mor	y 00	olên	a			1	
following page)			0	Co	de 1	tota	at		© Code 6 total						
			0	Co	de 2	? tot	i		G	Cc	de 7	7 tot	ai		
Input data in order and find total of 9 classifications	for a maxim	num	6	Co	de 3	3 tota	al		() co	de 8	3 tot	al		
			(Co	de 4	tota	al		() Co	ode (tot	al	-	
			Code 5 total Memory excland overall to								cha tota	nge ai			
Calculation flow chart	ST# MJ					O G								Ste	
All memories cleared	317 110	MAC						-							
ST#1 To get	ST#1:	1117.13						_					-		
Classification code MJ	31#1.	CAIT	1	:	٠		-	<u> </u>			\vdash	\vdash	-	7	
Change classification		ENT 0	-		:							-		H	
memory				IM	-			-			-	-	-	14	
Data		ENT	EMI =	: IM	+	0	:		<u> </u>				-	 	
Classification total		IM	1		7	-	*	_						2:	
GoTo		GoTo		*					-			-	\vdash	<u> </u>	
MJ	MJ		*	40	0	:		\vdash			_	\vdash	-	\vdash	
Code/Total to 0		0	-	K	:	•		_			<u> </u>		-	33	
		1		٠				-	_		-			3,	
ST#2	ST#2:				+	к	1	:				-		4:	
Code count		ANIC	10.0		+	-	1			-				4.	
Classification total		ANS	IM	:		88.5			-		-	-	-	5:	
coda <9 code >9		0	=	0	+	M		2	;	3		3	:		
Is the code 9?	PT #2.	IF	_	=	K	9	:		•	3	<u> </u>	3	•	-	
ST#3 code=9 Overall total	ST#3:	ANS	0	:		-					ļ			70	
Overall total			-		_				-	-					

^{*} Performing program calculations is explained on the next page.

CASIO PRO fx-1 Program calculation operation manual

Calculation ex	kample	actu	al calc	ulation t	able, values, etc.	Memory no.	When ENT lamp is lit (data)	When ANS lamp is lit (answer)
classification						1	code 1 data	code 1 total
code 3	Dat 1,85		-		Total (5,600)	2	code 2 data	code 2 total
1	3,10	ж		2	(3,450) (7,210)	3	code 3 data	code 3 total
2 9	3,60			4	(8,010)			
4 2	6,12				(8,350) (3,190)	4	code 4 deta	code 4 total
8	3,88	30		7	(4,270)	5	code 5 data	code 5 total
5 3	2,23 5,36				(7,180) (3,600)	6	code 6 data	code 6 total
5 6	4,87 3,19			total (50,860)	7	code 7 data	code 7 total
7	2,31	0	fig	jures in p	parentheses are	8	code 8 data	code 8 total
7	2,50		an	swers				
8	3,30	X3				9	code 9 data	code 9 total
5 4	1,89					0		data total
						E {I-memory	classification code	
reparation:		Procedure	Lamo	Memory	Display mea		Key operation	Remarks
l. Write-in prog		1		No.	Display mad		START	
Program swit	RITE	2	ENT	E	classification co	de input	3 💷	code is 3 so 🗓
	WRITE		ENT	3	data input		1850 ENT	3 light
Key-in in the sequence of t		4	ENT	E	classification co	de input	1 🖼	code is 1 so
program		5	ENT	-	data input		3100 📶	∫ 1 light
Program calc Program swit		6	ENT	E	repeat the follo		·	
COMP	_	7	4 110	4		When all	data end, MJ	
		8	ANS)	code 1 total		ANS ANS	
The following the sequence		10	ANS		code 3 total		24	_
given at the r	ight	11	ANS	-	code 4 total		ZMA	
		12	ANS		code 5 total		AMS	
		13	ANS	6	code 6 total		ANS	
		14	ANS	7	code 7 total		ANS	
		15	ANS		code 8 total		ANS	
		16	ANS	-	code 9 total		ANG	
		17 18	ANS	0	all data total		end of calculatio	I AL
		19						
		20						
		21						
		22						
		23						
		24						
		25			l			

GASIO PRO fx-1 PROGRAM SHEET

rogram name Prediction by reg	ression analy:	sis (pri	mär	/ reg	ressi	ion)			Da	te		No.	2		
Formula (examples using actual va	alues are on		Ī			 -	Me	mory	/ 60	nten	t				
the following page) If the regressing straight line is			Q)	dat	a	х		(3)	Σ	ry			
$B = \frac{n\Sigma xy - \Sigma x \cdot \Sigma y}{n\Sigma x^2 - (\Sigma x)^2}$	ト Bx,		(2)	dat	a	У		G	D count n					
$A = \frac{1}{n}(\Sigma y - B \cdot \Sigma x)$			(3)		Σx			(9)	determined coefficient				
Predicted value \hat{y} is $\hat{y} = A + Bx$			(4)		Σγ			0	9)		rmined			
			(5)		Σχ	2	·	0	0					
Calculation flow chart	ST# MJ				R O			age					Ste		
All memories cleared		MAC													
→ ST#1	ST#1:														
Data x, y when		ENT	1	:	2	:							!		
all data input		3	*	3	+	1	:								
complete		4	=	4	+	2	:						2		
Σx Σy		5	=	1	×	1	+	5	:						
Σx² calculation		6	=	1	ж	2	+	6	:				3		
Σχy n count		7	=	7	+	k	1	;							
GoTo		GoTo	1	:									4		
MJ	MJ					L.							\perp		
Coefficient A calculation		8	-	3	x	3	:								
Coefficient B		8	-	7	x	5	-	8	:				6		
		9	*	3	ж	4	:								
		9	-	7	X	6	-	9	÷	8	:		7		
		8	=	9	×	3	+/-	+	4	÷	7	:			
Coefficient A, B		ANS	8	:	9	:	_						9		
> ST#2	ST#2:														
Prediction x		ENT	1	:									10		
ŷ calculation		2	=	1	x	9	+	8	:						
Prediction value ŷ		ANS	2	:											
GoTo		1305	^2	:		-							11		
													-		
							-		_						
		+		-		-	\vdash								

^{*} Performing program calculations is explained on the next page.

CASIO PRO fx-1 Program calculation operation manual

culation example.	actua	calcu	lation tab	ole, values, etc.	Memory no.	When ENT la is lit (data)	mp	When ANS lamp is lit (answer)
	les amour 813.6	nt (y)	(Unit \$1,	(000)	1	уеаг		
1966 1967	781.3				2	amount		predicted amount
1968 1969	855.1 1,228.7				3			
1970 1971	1,432.4 1,574.9				4			
1972 1973	1,697.2 2,069.5				5			
1974 1975	1,986.0				6	-		
1976	(2,451.2) (2,629.1)		Predic	tion	7			-
1977 1978	(2,806.9)		Fredic	CION				determined
y = A + 8x A	= (-6,61	9.9 }	for 0	year	8			determined
) - A - LL B	= (17	7,86}	trend each		9			coefficient B
					0			
					E (1-mamory)		
reparation:	Procedure	Lamp	Memory No.	Display me	gning	Key operat	ian	Remarks
Write-in program	1					START		
Program switch WRITE	2	ENT	1	year input		66	ENI	
7 3	3	ENT	2	amount input		813.6	BÜ	
Key-in in the	4	ENT	1	year input		67	(181)	
sequence of the	5	ENT	2	amount input		781.3	EN1	
program		ENT	1		eneat from	procedure 2		
 Program calculation Program switch 		ENT	•			data end, M	J	
COMP	7		-	determined co		-	AMS	
	8	ANS	8	determined co			AHS	
The following in	9	ANS	-			76		
the sequence	10	ENT	1	prediction yea			100 m	
given at the right	11	ANS	-	prediction am			EMI	
	12	ENT	1	prediction ye		77		
	13	ANS	+	prediction am		+	AUKS	
	14	ENT	1	repeat from p	rocedure 1			
	15		1			end of calc	ulatio	n AC
	16		dr D D					
	17							
	18	1						
	19	1 -						
	20	1	1					
			-	 				
	21	-		-				
	22	-		+		-		
	23	-	-					
	24	-						
	25		*					

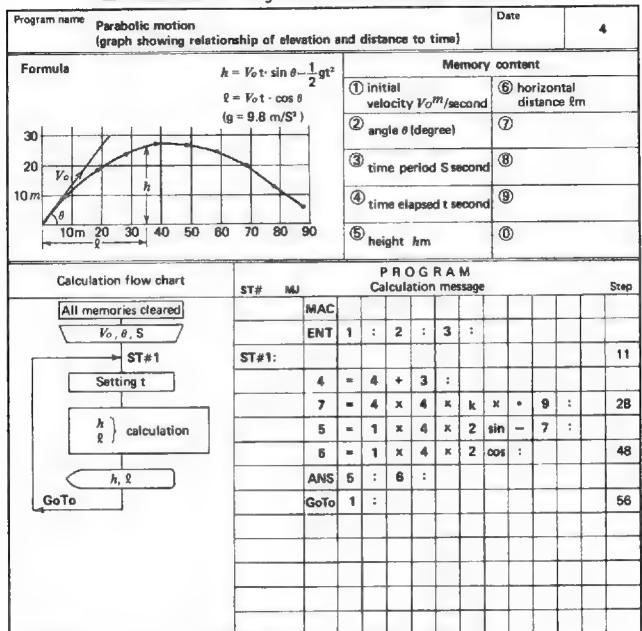
CASIO PRO fx-1 PROGRAM SHEET

rogram name Area and length of	f one side of	an n-sid	ded	regu	lar p	olyg	ЮП			date		1	ło.	3
Formula							M	епто	ry o	onte	nt			
The	length a) of area S) of an	one side)	radi	us of	circ	:le	(6)				
regul	lar polygon i e a circle wi	fitting	C	0	num of p	ber	of si	(7)					
Area 5 radio		$\alpha \left(= \frac{360}{n} \right)$							<u>B</u>)				_	
S = "	Ir² sin α	length of one side a)							9		<u>*</u>			
$(\alpha = 3)$	360°)		(S) o lar p		ЮП	(0)				
Calculation flow chart	ST# N	IJ) G ition)					Ste
>T#1	ST#1:													
Radius r and n		ENT	1	:	2	:								
		3	=	K	3	6	0	+	2	:				17
		4	=	3	÷	K	2	:						
a S calculation		4	-	K	2	×	1	ж	4	sin	:			34
S Conconaction		5	=	1	х	1	ж	2	×	3	sin	+		
			k	2	:							-		
a, S		ANS	4	:	5	:								
GoTo		GoTo	1	:										56
				-	_								-	
			\dashv											
										,				

Program calculation operation manual '

Preparation: 1. Write-in program	Procedure	Lamp	Memory No.	Display meaning	Key operation	Hemarks
Program switch WRITE	1				START	
WHITE	2	ENT	1	r input	10 💷	radius 10 cm
	3	ENT	2	n input	7 EN	for regular heptagor
* Key-In in the sequence of the	4	ANS	4	a display	ANS	a= 8.6776748 cm
program	5	ANS	5	S display	AHS	S= 273.641018 cm ²
2. Program calculation	6	ENT	1	r input	12 ENT	radius 12 cm
Program switch COMP	7	ENT	2	n înput	8 🖽	for regular octagon
	8	ANS	4	a display	AKS	a= 9.18440232 cm
* Angular mode	9	ANS	5	S display	ANS	S=407.2935052cm ²
selector: "DEG"	10	ENT	1	repeat form	procedure 2	
The following in the sequence	11				end of calcula	tion AC
given at the right	12					

CASIO PRO fx-1 PROGRAM SHEET



Program calculation operation manual

Preparation; 1. Write-In program	Procedure	Lamp	Memory No.	Display meaning	Key operation	Remerks
Program switch WRITE	1				START	
451	2	ENT	1	Vo input	30 🔢	initial velocity 30m/
* Kev-in in the	3	ENT	2	∂ input	50	angle 50°, time
sequence of the	4	ENT	3	time period S input	• 5 EM	period 0.5 sec.
program calculation	5	ANS	5	height after S seconds		hI = 10.2656668
* Program switch	6	ANS	6	distance after S seconds	ANS.	11 = 9.64181415
EOMP	7	ANS	5	height after 2S seconds	ŽMA	h2 = 18.0813332
	8	ANS	6	distance after 25 seconds	NE DE	/2 = 19.2838283
* Angular mode selector: "DEG"	9	ANS	5	height after 3S seconds	NE C	$h_3 = 23.4469998$
The following in	10	ANS	6	distance after 3S seconds	AMS	<i>l</i> 3 ≈ 28.92544245
the sequence given at the right	11	ANS	5	repeat from pr	ocedure 5	
	12		4		end of calcu	lation AC

CASIO PROfx-1 PROGRAM SHEET

Program name Hyp	perbola fun	ction							d	ate		N	lo.	5
Formula							М	emoi	y a	onte	nt			
$\sinh x = \frac{e^x - e^{-x}}{2} \qquad \dots$	code 1		0	D	5ii	sh x			(5)				
-			0)	CC	sh x			0	D				
$\cosh x = \frac{e^x + e^{-x}}{2} \dots$	code 2		(3	0	ta	nh x	_		(3				
$\tanh x - \frac{\sinh x}{\cosh x} = \frac{e^x - e^{-x}}{e^x + e^{-x}}$	code 3		(D					0	9				
			(5)				_	(2)		data	х	
* Data Ell code Ell → answei			1	mer	nory	+0	ode	,,-						
Calculation flow chart	ST# M.	1			P R (, M ssage	;					Ste
ST#4	ST#4:													
Data x, code		ENT	0	:	1	:								
code=1 code=3		1F	1	=	k	2	:	1	:	2	:	3	;	
Y SUB#2 ¥ code=2 ¥		ANS	IM	:				1						
GoTo Answer display SUB#3		GoTo	4	:										26
SUB#1 sinh calculation	SUB#1:													\vdash
		1		0	ex	_	0	+/-	ex	÷	k	2	:	41
SUB#2 cosh calculation	SUB#2:													T
		2	=	0	ex	+	Ð	+/	e ^x	÷	k	2	:	56
SUB#3 tanh calculation	SUB#3:													
		9	-	0	ex	+	0	+/-	ex	:				
		3	=	0	تنع	-	0	+/-	e ^X	÷	9	:		79
	Remarks:	1/x can	not b	e pu	t inte	prog	ram							

Program calculation operation manual

Preparation :	Procedure	Lamp	Memory No.	Display meaning	Key operation	Remarks
* Program switch WRITE	1				START	
	2	ENT	0	data x input	1.2	answer is
* Key-in in the	3	ENT	E	code input	1 EHT	1.509461345 for
sequence of the	4	ANS	1	sin <i>l</i> ex input	AMS	sinh 1.2
program 2. Program calculation	5	ENT	0	data x input	2.5 ENT	answer is
* Program switch	6	ENT	E	code input	2 N	6.132289499 for
COMP	7	ANS	2	cos hx display	A A	cosh 2.5
	8	ENT	0	data x input	9 💷	answer is
* The following in the sequence	9	ENT	E	code input	3 EN	0.716297868 for
given at the right	10	ANS	3	tan h display	ZHA	tanh 0.9
	11	ENT	0	repeat f	rom procedure 2	
	12				end of calculation	on AC

CASIO PRO fx-1 PROGRAM SHEET

Program name Invarse	hyparbola	function	on				,		D	ate		N	lo.	6
Formula							M	emo	ry o	onte	nt			
$ sinh^{-1} x = ln (x + \sqrt{x^2 + 1}) \dots cosh^{-1} x = ln (x + \sqrt{x^2 - 1}) \dots $			(D	sir	h-1	x		0	5)				
[x>1]	1		② cos h ⁻¹ x ⑦											
$tanh^{-1} x = \frac{1}{2} ln \frac{1+x}{1-x}$. code 3		③ tan h ⁻¹ x ⑧											
* Data ∰ code ∰ → Answer	11		(4	D			-	0	D					
			(0		-			0	0		data	x	
			1-	mer	погу	→ c	ode							
Calculation flow chart	ST# M.	1			P R (Ste
ST#4					_		_	_						
code=1 code=3	ST#4:	ENT	0	:	1	:				L.,				
Is ∞de 2?		IF	1	-	k	2	:	1	:	2	:	3	:	
SUB#1 SUB#2 Code=2 SUB#3		ANS	IM	:										
Aliswer display		GoTo	4	:										20
SUB#1 sin h ⁻¹ calculation	SUB#1:	9	-	0	×	0	+	k	1	:				
		9	-	9	$\sqrt{}$	+	0	:						
		1	-	9	In	:								50
SUB#2 cos h ⁻¹ calculation	SUB#2:	9	-	0	и	0	-	k	1	;				
		9	*	9	5	+	0	:						
		2	-	9	In	:								72
SUB#3 tan h ⁻¹ calculation	SUB#3:	9	=	lc	1	-	0	:						
		9	=	k	1	+	0	+	9	:				
		3	_	9		4	k	2	:					101

Program calculation operation manual

Preparation: 1. Write-in program Program switch WRITE Key-in in the sequence of the program 2. Program colculation Program switch COMP The following in the sequence given at the right	Procedure	Lamp	Memory No.	Display meaning	Key operation	Remarks
	1				START	-
	2	ENT	0	data x input	1.5 💷	answer is 1.1947632 for sin h ⁻¹ 1.5
	3	ENT	E	code input	1 ENI	
	4	ANS	1	$\sin h^{-1}x$ display	ANS	
	5	ENT	0	data x input	5.3 EN	answer is 2.3518328 for cos h ⁻¹ 5.3
	6	ENT	E	code input	2 ENT	
	7	ANS	2	cos k 1 x display	ANS	
	8	ENT	0	data x input	· 6 E	answer is 0.6931472 for ten h ⁻¹ 0.6
	9	ENT	E	code input	3 (1)	
	10	ANS	3	tan h ⁻¹ x display	ANS	
	11	ENT	0	repeat	from procedure 2	
	12				end of calculation	AC

Specifications

NORMAL OPERATION

Capabilities:

4 basic functions, chain & mixed operations, constant calculations for five functions, powers and reciprocals, automatic accumulation in four functions, direct access to the memory, true credit balance and various kinds of practical calculations.

SCIENTIFIC FUNCTION

Trigonometric/Inverse trigonometric functions, common/natural logarithmic functions, Exponentiations, square roots, reciprocals, sexagesimal/decimal conversion. Pi entry and scientific notation.

Capacity:

Output accuracy Input range 10 digit mantissa or 8 digit mantissa plus 2 Entry/basic operations digit exponent (powers of ten from 1099 to to 10-99). $\sin x / \cos x / \tan x$ $|x| \le 1440^{\circ} (8\pi \text{rad}, 1600 \text{gra}) \pm 1$ in the 8th digit $\sin^{-1} x / \cos^{-1} x$ $|x| \leq 1$ ±1 in the 8th digit $|x| < 1 \times 10^{100}$ $tan^{-1} x$ ±1 in the 8th digit $0 < x < 1x 10^{100}$ $\log x / \ln x$ ±1 in the 8th digit |x| < 10010X ±1 in the 8th digit ex $|x| \leq 230$ ±1 in the 8th digit $0 < x < 1 \times 10^{100}$ x^{y} ±1 in the 7th digit $0 \le x < 1 \times 10^{100}$ \sqrt{x} ±1 in the 10th digit $|x| < 1 \times 10^{100}, x \neq 0$ ±1 in the 10th digit

10 digit DECIMAL POINT Full floating mode with underflow

NEGATIVE NUMBER

Indicated by the floating minus (-) sign for mantissa.

The minus sign appears in the 3rd column for a negative exponent.

Up to second

OVERFLOW

Indicated by an "E" sign, locking the calculator.

±1 in the 10th digit

1 independent memory and 10 data memories. MEMORY

PROGRAM

Number of steps: 127 steps, stored system

10 memories for calculation and data totaling plus 1 indirect Memory:

address memory

Conditional and unconditional jump: max. of 10 jumps possible

Subroutines: max of 10 subroutines, 1 deep

1/x

0 . "

Other functions: Manual jump, multiple assembly of one constant, program

writing and check command display, and back-step.

MAGNETIC CARD

Functions: Program recording and readout using special magnetic cards.

Travel speed: 10 - 80cm/sec., manual movement.

Recording capacity: 127 steps.

Erase prevention: Programs are protected by adhering special protective tape.

READ-OUT

Zero suppression, Digitron tube panle, and LED for signs

POWER CONSUMPTION 1.5 W

POWER SOURCE

AC: 100, 117, 220 or 240V (±10V), 50/60 Hz with applicable AC Adaptor DC Four AA size Manganese dry batteries (SUM-3) operate about 6.5 hours continuously.

Four AA size Alkaline dry batteries (AM-3) operate about 12 hours continuously.

USABLE TEMPERATURE

 0° C ~ 40° C (32° F ~ 104° F); -10° C ~ 45° C (14° F ~ 113° F) for magnetic card.

DIMENSIONS:

36.5mmH x 115mmW x 197mmD (1-3/8"H x 4-5/8" x 7-7/8"D)
WEIGHT 490 g (17 oz) including batteries

Care of your new electronic calculator

This calculator is a durable, precision-made instrument which will provide you with years of trouble free service.

To help ensure this we recommend that the inside of the calculator not be touched. It is also inadvisable to subject the calculator to hard knockes, and unduly strong key pressing.

Extreme cold (below 32°F or 0°C), heat (above 104°F or 40°C) and humidity may also effect the function of the calculator. When you do not use the calculator for a long period, take out the batteries to prevent possible damage from battery leakage. Special care should be taken not to leave dead batteries inside the calculator. Please make sure you switch off the power when you finish your calculations or intend to open the cover to change batteries. Should the calculator need servicing, take the unit to the store where purchased or to a nearby dealer.

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CASIO₈

ABM House

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